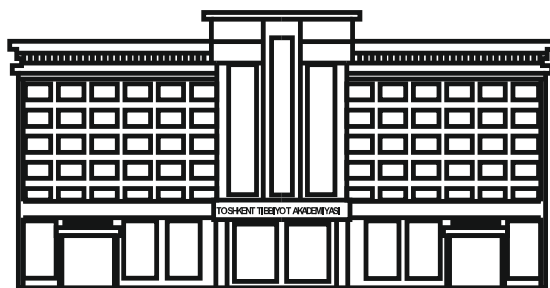


ЎЗБЕКИСТОН РЕСПУБЛИКАСИ СОҒЛИҚНИ САҚЛАШ ВАЗИРЛИГИ
ТОШКЕНТ ТИББИЁТ АКАДЕМИЯСИ

2023

2011 йилдан чиқа бошлаган

TOSHKENT TIBBIYOT AKADEMIYASI
АХВОРОТНОМАСИ



В Е С Т Н И К

ТАШКЕНТСКОЙ МЕДИЦИНСКОЙ АКАДЕМИИ

SPECIAL ISSUE

Dedicated to

The 10th International Symposium

On Important Problems of

the Environmental Protection and Human Health

Tashkent

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DEVELOPMENT OF AIR QUALITY MONITORING IN UZBEKISTAN AND ITS ROLE IN ENVIRONMENTAL MANAGEMENT

Rakhimov B.B., Salomova F.I.

РАЗВИТИЕ МОНИТОРИНГА КАЧЕСТВА ВОЗДУХА В УЗБЕКИСТАНЕ И ЕГО РОЛЬ В УПРАВЛЕНИИ ОКРУЖАЮЩЕЙ СРЕДОЙ

Рахимов Б.Б., Саломова Ф.И.

O'ZBEKISTONDA HAVO SIFATI MONITORINGNING RIVOJLANISHI VA UNING ATROF-MUHITNI BOSHQARISHDAGI ROLI

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В данной статье предоставляется анализ состояния качества атмосферного воздуха в различных городах Республики Узбекистан с 2011 по 2015 год. Исследование рассматривает концентрации основных загрязнителей воздуха, включая твердые взвешенные вещества (пыль), диоксид серы (SO₂), оксиды углерода (COx) и оксиды азота (NOx), сравнивая их с предельно допустимыми концентрациями (ПДК). Исследование подчеркивает значительную изменчивость качества воздуха в разных городах, где некоторые области поддерживают низкие концентрации загрязнителей в пределах ПДК, в то время как в других наблюдаются превышения ПДК. Заключение подчеркивает необходимость совместных усилий, включая правительство, научное сообщество и общество, для решения проблем загрязнения воздуха и улучшения экологических условий в Узбекистане.

Ключевые слова: качество атмосферного воздуха, загрязнители воздуха, твердые частицы, диоксид серы, оксиды углерода, оксиды азота, допустимые концентрации.

Ushbu maqolada O'zbekiston Respublikasining turli shaharlarida 2011-2015 yillardagi atmosfera havosi sifatining holati tahlil qilingan. Tadqiqot havodagi asosiy ifloslantiruvchi moddalar, jumladan zarrachalar (chang), oltingugurt dioksidi (SO₂), uglerod oksidi (COx) va azot oksidi (NOx) kontsentratsiyasini ko'rib chiqadi va ularni ruxsat etilgan maksimal konsentratsiyalar (REK) bilan taqqoslaydi. Tadqiqot shaharlar bo'ylab havo sifatining sezilarli o'zgaruvchanligini, ba'zi hududlarda ifloslantiruvchi moddalarning past konsentratsiyasi REKga mosligi, boshqalari esa REK dan oshib ketganligini ta'kidlaydi. Xulosa O'zbekistonda havo ifloslanishi bilan bog'liq muammolarni hal qilish va ekologik sharoitni yaxshilash uchun hukumat, ilmiy doiralar va jamiyatni o'z ichiga olgan birgalikdagi sa'y-harakatlar zarurligini ta'kidlaydi.

Kalit so'zlar: atmosfera havosining sifati, havoni ifloslantiruvchi moddalar, chang zarrachalari, oltingugurt dioksidi, uglerod oksidi, azot oksidi, ruxsat etilgan kontsentratsiyalar.

Introduction

Air quality and air pollution are key aspects of environmental safety that impact human health and the environment (1). Air pollution in modern cities is becoming an increasingly serious issue that requires attention and action from government authorities, researchers, and society (2). In the contemporary world, air pollution is a relevant problem for many countries, including Uzbekistan (3). One of the key aspects of assessing the state of the atmosphere is monitoring the concentration of pollutants (5). Another crucial aspect of air quality assessment is the establishment of permissible concentration levels (PCL) defined by regulations and legislation (6). Uzbekistan has established PCLs for various pollutants, which must be adhered to in order to ensure environmental safety and public health. Compliance with these norms is an important aspect of air quality management (7).

Air quality monitoring is a vital tool for collecting data on pollutant concentrations. Various methods and technologies are employed in Uzbekistan to monitor air quality. Automated monitoring stations and networks allow real-time tracking of pollutant concentrations and deviations

from established norms, which is crucial for timely response to air pollution issues.

Air pollution has a significant impact on human health and the environment. Studies show that prolonged exposure to polluted air can lead to various respiratory diseases, cardiovascular diseases, and even cancer (3). Additionally, air pollution affects plants, water resources, and biodiversity, which can result in environmental consequences.

To combat air pollution in Uzbekistan, various measures are being taken. Important steps include reducing emissions of pollutants from industrial and transportation sources, implementing modern technologies for emissions control, and improving energy efficiency. Government bodies and local authorities are actively working on developing environmental strategies and action plans to enhance air quality (4).

In this study, we present a scientific overview of the state of atmospheric air in the cities of the Republic of Uzbekistan from 2011 to 2015. We analyze the concentrations of various pollutants, such as particulate matter (dust), sulfur dioxide (SO₂), carbon oxides (COx), and nitrogen oxides (NOx).

Method and Methodology

To conduct the research on the state of air quality in the cities of the Republic of Uzbekistan from 2011 to 2015, a comprehensive set of methods and methodological approaches were employed, involving data collection, analysis, and interpretation.

Data on pollutant concentrations in the atmosphere were obtained using a network of automated monitoring stations. These stations are equipped with sensors and instruments capable of measuring real-time concentrations of particulate matter (dust), sulfur dioxide (SO₂), carbon oxides (COx), and nitrogen oxides (NOx). The data is collected automatically and transmitted to the central database of the Uzbekhydrometcenter (the Hydrometeorological Service Center under the Cabinet of Ministers of the Republic of Uzbekistan).

For the processing and analysis of data on pollutant concentrations, statistical methods and software were used, allowing for the assessment of the proportion of emissions from various pollutants, changes in concentrations over the years, and comparisons with permissible concentration levels (PCL).

In accordance with Uzbekistan's environmental regulations, the study employed the PCL as crucial bench-

marks for assessing air quality. These PCL values represent the legally established limits for key air pollutants, ensuring compliance with stringent environmental standards. The PCL levels for the following pollutants were considered in the study: solid particulate matter (PM), sulfur dioxide (SO₂), carbon oxides (COx), and nitrogen oxides (NOx), with respective PCLs of 0.15 mg/m³, 0.05 mg/m³, 3.0 mg/m³, and 0.06 mg/m³.

Results

This section presents the results of the research on the state of air quality in various cities of the Republic of Uzbekistan from 2011 to 2015 in the form of an analysis of pollutant concentrations, a comparison with permissible concentration levels (PCL), and the identification of trends in the changes in air pollutant concentrations.

Particulate Matter (Dust)

The analysis of dust concentrations in the atmosphere revealed variations in different cities of the Republic of Uzbekistan from 2011 to 2015. In some cities, such as Bekabad and Bukhara, dust concentrations remained close to the permissible concentration levels (PCL), while in others, like Nukus, exceedances of PCL were observed. This indicates the non-uniformity of air pollution in different regions.

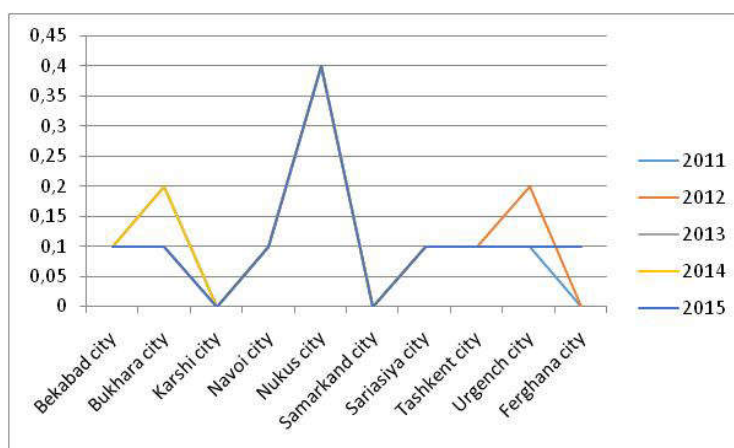


Figure 1. State of atmospheric air (particulate matter) in the cities of the Republic of Uzbekistan from 2011 to 2015 (mg/m³).

Sulfur Dioxide (SO₂)

Regarding SO₂ concentrations, differences were also observed between cities. In Karshi and Urgench, SO₂

concentrations were high, while in other cities, such as Sariasya and Nukus, they remained at lower levels.

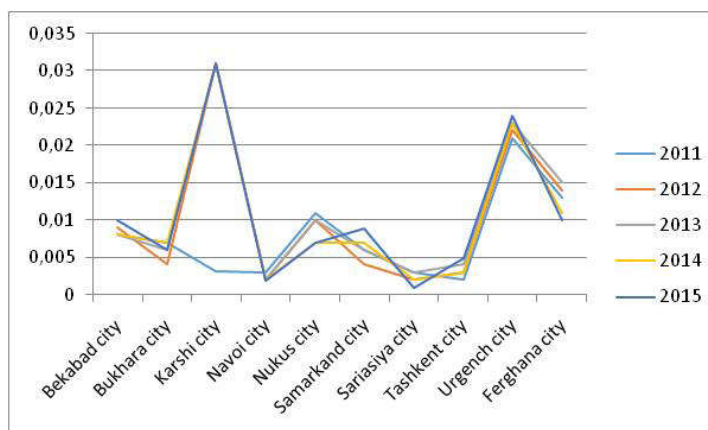


Figure 2. State of atmospheric air (sulfur dioxide) in the cities of the Republic of Uzbekistan from 2011 to 2015 (mg/m³).

Carbon Oxides (CO_x)

The analysis of carbon oxide concentrations showed variations in different cities. Bukhara, Nukus, and

Tashkent had exceedances of PCL for CO_x, while in other cities, such as Karshi and Urgench, CO_x concentrations remained below the established norms.

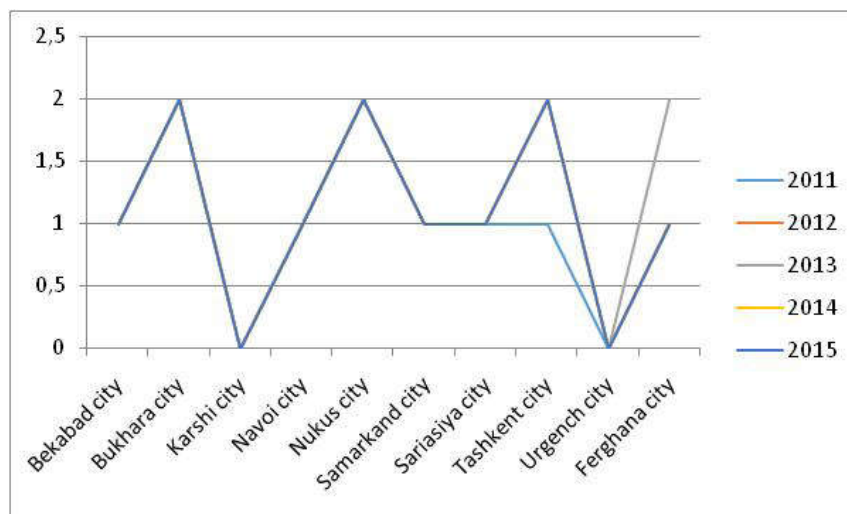


Figure 3. State of atmospheric air (carbon oxides) in the cities of the Republic of Uzbekistan from 2011 to 2015 (mg/m³).

Nitrogen Oxides (NO_x)

Concentrations of nitrogen oxides also varied in different cities. In some cities, such as Tashkent and Navoi,

NO_x concentrations were high, while in other cities, like Karshi and Sariasia, they remained at lower levels.

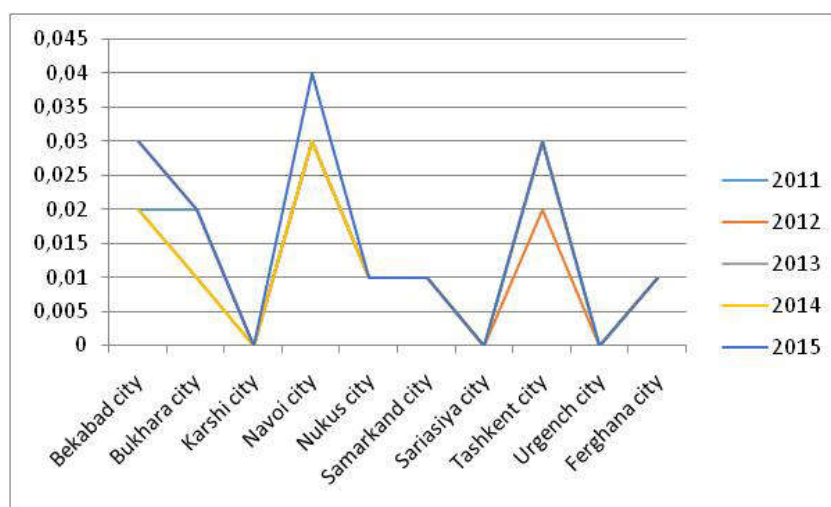


Figure 4. State of atmospheric air (nitrogen oxides) in the cities of the Republic of Uzbekistan from 2011 to 2015 (mg/m³).

Comparison with PCL and Concentration Trends

The research results allowed for an assessment of the compliance of pollutant concentrations with permissible concentration levels (PCL). In several cities, such as Bekabad and Samarkand, concentrations of dust, SO₂, CO_x, and NO_x remained within the established norms. However, in Nukus, exceedances of PCL for various pollutants were observed.

The analysis of data from 2011 to 2015 allowed for the identification of trends in the changes in air pollutant concentrations. Some cities showed an improvement in the situation with a decrease in concentrations, while others exhibited fluctuations or even an increase in pollution.

Discussion

The data analysis reveals that the air quality situation varies significantly between different cities in Uzbekistan.

In some cities, such as Bekabad and Samarkand, pollutant concentrations remained relatively low and complied with permissible concentration levels (PCL). However, in Nukus, exceedances of PCL for various pollutants were observed. This diverse situation necessitates a differentiated approach to addressing air pollution issues in different regions.

Various factors influence pollutant concentrations in the atmosphere, including industrial activities, transportation, energy sources, and climatic conditions. In cities with developed industries and heavy automotive traffic, such as Tashkent, pollutant concentrations can be higher due to emissions from pollution sources. Additionally, climatic conditions, such as wind and precipitation, can affect the dispersion of pollutants in the atmosphere (e.g., Nukus).